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THE PLACE OF DESCRIPTION, DEFINITION AND CLASSIFICATION IN PHILOSOPHICAL BIOLOGY

BY PROFESSOR WM. E. RITTER

SCRIPPS INSTITUTION FOR BIOLOGICAL RESEARCH

Empirical theory of knowledge tends to regard detailed, complete description as identical with explanation. (Professor R. Adamson.)

. . . it would hardly be too much to define logic as the theory of classification. (W. S. Jevons.)

Science can extend only so far as the power of accurate classification extends. If we can not detect resemblances and assign their exact character and amount, we can not have that generalized knowledge which constitutes science. (W. S. Jevons.)

. . . the mathematical and mathematico-physical sciences have, in a great degree, determined men's views of the general nature and form of scientific truth; while natural history has not yet had time or opportunity to exert its due influence upon the current habits of philosophizing. (Wm. Whewell.)

I WISH to point out in the briefest way possible the vital importance to biology of the truth of these statements.

We are familiar with the view that the transition from the pre-Darwinian to the Darwinian era of biology was accompanied by a complete revolution of conception as to the significance and value of our systems of classification of living beings. The current notion is that the old taxonomy was superficial in that it was merely descriptive, but that, with the oncoming of the doctrine of evolution, it became profound because it then became a record of evolution. While formerly we are wont to say, the schemes of classification were only logical, or verbal, those of the present era are truly scientific, because natural; and they are natural because based on genetic kindred. And in the minds of many biologists the still further notion has gained lodgment that systematic zoology and botany should be looked upon as marking the juvenile period in the life of biology; and as having been outgrown and left behind when evolution came, something as a boy's falsetto voice and beardless face are left behind when puberty is reached. It is this view, I suppose, which makes many a present-day biologist feel that if by chance he is caught having anything to do with description and classification, he must explain that it is only a little by-play with him, that he is not really interested in it, it being too small a matter to merit the full occupancy of his manly powers.

I want to show three things: first, exactly what has happened to taxonomy as biology has progressed; second, something of the monstrousness of the fallacy into which biologists have fallen in conceiving taxon-

omy as an outgrown stage in the development of biology; and third, something of the wretched consequences that have resulted from the fall.

A quotation from Huxley's "Life of Owen" may serve as a starting point of the discussion:

The classifications of the scientific taxonomist are of two kinds. Those of the one sort are merely handy reference catalogues. . . . The others, known as *natural* classifications, are arrangements of objects according to the sum total of their likenesses, in respect of certain characters. . . . And natural classification is of perennial importance, because the construction of it is the same thing as the accurate generalization of the facts of form, or the establishment of the empirical laws of the correlation of structure.

That which makes taxonomic biology as practised by many systematists genuinely superficial, and has so depreciated its value in the minds of many biologists, is failure to distinguish sharply and see the profound significance of the difference between the two sorts of classification referred to by Huxley. The sort of classification which he calls "merely handy reference catalogues," I call *synoptic classification*, and remind the reader that such classification rests upon *synoptic description*. The other sort of classification, said by Huxley to be of "perennial importance, because the construction of it is the same thing as the accurate generalization of the facts of form," I call *analytic classification*, and ask the reader to note that it rests on *analytic description*, just as synoptic classification rests on synoptic description. And here I must state that analytic description and classification will include considerably more, as I use them, than was included by Huxley in his second sort of classification.

In order to bring into clearer view the close kindred between the biological and the logical aspects of our subject, we shall so choose our language as to fix attention quite as much on the *meaning of the names* used, as on the natural objects to which the names are applied.

If any one is disposed to shy at the proposal to thus connect biology with logic, he may be reminded of a dictum of one of the most famous and also the most objective of biologists—Cuvier. "In order to name well, you must know well," said the father of comparative anatomy. The import of this straightforward statement is that natural science deals with natural objects and that the names of these objects are the instruments by which the work is done. As a speculator, Cuvier did not escape the common weakness of the class, that of permitting Ideas to so intrude themselves between object and name as to prevent assurance that the two should really fit each other; but, as naturalist he stood firmly for the practise of making both knowing and naming apply very directly to the object. So far he was on the road to the sound position later definitely taken by J. S. Mill as a logician, that common sense is right in calling the word which stands for an object the name of the object, and not merely the name of our idea of the object.

Biology and logic, as understood in this discussion, have very much in common in that biology can do nothing with the natural objects which are its subject matter except through the instrumentality of a great lot of names; while logic can do nothing really significant with names of ideas concerning living beings unless those ideas have their exact counterparts in the objects themselves.

To be explicit, we shall deal with the description, definition and classification of *man*; but instead of doing this in the usual terminology of the systematist, we shall talk about the meaning of the word "man."

Imagine a normal child born on an oceanic island, the only animal inhabitants of which are its mother and itself; and imagine further that the mother, an educated woman, has taught her child all sorts of things, except about other human beings or other animals. Not the smallest fragment of information has she imparted to the child about its own kind, other than its mother. What would be the character of the child's knowledge of the humankind? Does any one question that it would be considerable, definite and real? Would not the child know its mother's form and countenance and voice, and many other things about her, just as well as though it knew innumerable other people? Unquestionably. It would have a descriptive, but no definitive knowledge of man, except in so far as the knowledge of itself would be differentiated from its knowledge of its mother.

Authorities on logic make a good deal of the point that "the concrete individual object can be described, but not defined." And they say, furthermore, that description is synonymous with "accidental definition," this latter being again defined as assigning the "accidents" of an individual. But since the "accidents" of an object have been, according to much historical logic, set over against its "essence," "accidents" have usually been treated by logic as a sort of Cinderella, the homely, despised sister, in the family of so-called Predicables.

I find justification for going thus much into logical doctrine in the fact that recent biology has shown a strong tendency to follow formal logic in exalting essence and despising accidents.

The practical point to be brought out is this: no matter how insignificant, or obscure, or transitory, may be a certain attribute of an object, in so far as that attribute is positively and repeatedly observed, it furnishes just as trustworthy a piece of knowledge about that object, as any attribute whatever can furnish.

Suppose the mother of our hypothetical island child had a mole on her chin; or that the sunshine brought out freckles on her nose which disappeared again during the winter. These marks would be accidents, according to logic; and biologically regarded would be quite insignificant. But they would be as indubitable elements in the child's knowledge of its mother as any other elements that can be mentioned.

Let me ask any reader who is "keen" enough on the different kinds of automobiles to be able to distinguish most of the "makes" as they are passed on the road, what marks he relies on for identifying each type of car? Is it not true that in most cases you depend upon one or a few very trivial things? Color comes in; but, on the whole, one finds himself giving less attention for identification purposes to this conspicuous attribute than to others far less conspicuous. Just now the shape and color, not the name, of the manufacturer's plate placed on the radiator of so many machines, is a good identification mark for machines coming toward one. For the rear view of a machine with the top up, the number and shape of the window panes in the back curtain are useful marks.

The purely logical points deserving emphasis in this familiar but typical case are: first, the trustworthiness of the identification marks in spite of their triviality. The number and shape of the windows in the back curtain are just as positive and real as traits, that is, they are, logically regarded, just as important attributes of a particular class of machines as the number and shape of the cylinders; and second, the fact that using the marks in the way we do is purely descriptive, so far as concerns the recognition of an individual machine, but is definitive in so far as that machine is differentiated from any other kind of machine. Had there never been more than one automobile made, so that then there could be no question of distinguishing it from others of its kind, the windows would still be no less positive and real, though they would not, manifestly, then furnish distinguishing traits within the general class automobiles. But here there comes to view a difference of the utmost importance between the way attributes are definitive of man-made objects like automobiles, and natural living objects like men. In the first class of objects we are perfectly sure that many, usually most, of the attributes which the old logic would call accidents had no genuinely dependent relation to most of the other attributes of the object; while in living beings, especially of the higher classes, we are now certain that the great majority, if not all, the attributes, even those which formal logic would call accidents, are in vital relation with many, usually very many, other attributes. Thus recurring to the shapes of back curtain windows in automobiles and freckles on the nose of our hypothetical island mother, we know that the former have no fundamental relation to the more essential attributes of the machines, as, for example, the style of engine or carburetor or magneto; while on the other hand we know with equal certainty that freckles are vitally related to, indeed are wholly dependent upon, various other attributes, notably the complex attribute known as complexion, which again is vitally related to the blood system, and so on.

There are few, if any, points at which biology is more at sea than

in this very matter of the factual and logical, *i. e.*, the objective and subjective relation of the attributes or traits of organisms to one another and to the whole.

We now return to the problem of defining the word man. By the time any normal child is four or five years old he is in possession of the raw materials of a fairly comprehensive and entirely reliable description, a less extensive, but still unequivocal, definition, and the first of the essentials of a classification of man. He positively knows some of the attributes which distinguish a man from a house or a rock; some of those which distinguish him from a tree; probably some of those which distinguish him from a fly; probably, too, some of those which distinguish him from a chicken; and almost certainly some of those which distinguish him from a dog, a cat, a cow, and a horse. In a word, he has the raw material for the synoptic description and classification of man; that is, for the synoptic meaning of the word man.

Attention should here be called to the fact that the synoptic classification of man as elementary biological instruction presents it is apt to be slighted at its two ends. Too frequently, the beginning is made with:

<i>Kingdom,</i>	<i>Animal, and runs on:</i>
<i>Province,</i>	<i>Metazoa.</i>
<i>Phylum,</i>	<i>Vertebrata.</i>
<i>Class,</i>	<i>Mammalia.</i>
<i>Order,</i>	<i>Primates.</i>
<i>Genus,</i>	<i>Homo . . . and ends with</i>
<i>Species,</i>	<i>Sapiens.</i>

The point of criticism is that the super kingdom, the Empire (if our terminology must retain its ancient monarchic coloring), is not constantly enough included at the broad end; and at the narrow end the subspecies or variety is more frequently slighted than it ought to be; and from the very apex the individual is almost entirely ignored.

"*Empire, Living Being, or Orgainism, or Bios*" ought to be always included as the logician's genus generalissimum; and, at the other end, "*Individual, Eleanor, Ezra,*" etc., ought to be always included as the logician's species specialissima, or infirma species.

The synoptic description, definition and classification of man would then be: any natural body which is multicellular has a vertebral column, suckles its young, habitually walks erect on its hind limbs and uses its fore limbs for prehension, and talks rationally. And this is, too, both a biological and a logical meaning of the word man.

It is desirable to raise the question at this point as to the difference between the biological and the logical meaning of the term man. The kernel of the difference seems to me statable thus: The briefest possible biological meaning of the word spreads it out, as one might say, evenly over the whole living world, while the briefest possible

logical meaning does not do this. The insular mother whom we invoked in imagination may be supposed to teach her child formal logic, and, in so doing, to make use of herself and her child to illustrate the logician's use of the terms genus and species. She might say to the child:

You and I are natural bodies like the rocks and the clouds; but since we talk with each other, a thing which neither rocks nor clouds can do, we are particular kinds of natural bodies. When bodies stand in such relation as this to one another, we, as logicians, speak of them as being in the relation of genus and species.

So far as I can see, this example, if supplemented by others of like import that might be drawn from inanimate nature, could be made to completely satisfy the needs of formal logic as touching its doctrines of naming, defining, dividing, classifying. In a word, formal logic is not obliged to take cognizance of the fact that living nature contains any organisms other than man himself. Logic is something that can be used upon living beings generally with great effect—something that can occupy itself very interestingly and profitably with such things, but it is not obliged to be so used.

Logic goes to nature to get illustrations of how thought works rather than to actually learn nature. Reverting to Jevons's statement that logic may be defined as the theory of classification, we may remark that, so far as external nature is concerned, while logic may be defined as the theory of classification, it can not be defined as the practise of classification. It is important to call attention to this distinction between logic and biology since even biologists frequently fail to recognize it and are beguiled into trying to impose the laws of thought upon nature by asserting that such and such a supposition about nature is a "logical necessity." Although logic is so important to the natural scientist as an instrument, quite as important is it never to forget that it is only an instrument. Logic is one of the many children of nature; it is not its parent or ruler.

A practical point to be noticed here is that right regard for logic in the business of the taxonomist clearly reveals both the unwarrantableness and misfortune of the view, so widely held, that synoptic descriptions and classifications are artificial or puerile, and devoid of scientific value. If such a definition of man as that just given does not express his nature—is not a natural definition—in what terms, pray, can he be naturally defined? The definition is natural, but meager. This and not its artificiality is its fault; and from this fault arises the need for the second kind of classification spoken of at the outset.

To this other sort of classification and the second meaning of the word man, we now turn. Logic lays great stress on the difference between extension and intension in the meaning of names. When the

word man is merely thought of as applying to the individuals of the human species, its meaning in extension is before us. When, on the other hand, thought goes to the attributes of man, to what makes him a man, rather than to individual men, it is occupied with the meaning in intension of the word.

Now, as to our point about the second, the analytic classification of man—the analytic meaning of the word man. Let us begin with the reminder that meaning in intension is concerned not with the mere naming of objects, but with the attributes of the objects named.

Let the reader recall that taxonomic research in both zoology and botany has for years, so far as it has been based on morphology exclusively, taken as one of its guiding principles *neglect nothing*. This means, stated in the terms of logic, that this aspect of taxonomy has incorporated into its purpose and method, the study of terms in their intension. This is really, I believe, what was in Huxley's mind, at least in the back-ground of it, when he asserted that the second kind of classification is the "same thing as the accurate generalization of the facts of form."

A prime object of this paper is to contend that biology has now reached a stage in its progress where we can no longer restrict our dictum "neglect nothing" to morphological attributes, but must extend it to all attributes of organisms whatever—morphological, physiological, ecological, chemical and all the rest. And it should be pointed out that the movement of biology in this direction was more or less distinctly seen by at least one biologist nearly a century ago, namely, G. R. Treviranus. "The doctrine of organization," he said, "is founded upon comparative anatomy, or the systematic distribution of living bodies, and on organic chemistry."

I believe a comprehensive review of the whole range of biological results won during the last five and twenty years, let us say, will convince any one that each of the main provinces of research—comparative physiology, ecology, experimental behavior, genetics and biochemistry, no less than histology, cytology, embryology and regeneration, would furnish differentia for a classification of the organisms used in the researches; or at least that they contain differentia corresponding to the systems of classification previously established on the basis of pure morphology.

What does this signify for the attitude of biologists toward their problems, and for methods and enterprises of research?

It signifies many things, one of which particularly concerns us now, and may be put into the following general proposition: No biological phenomenon is adequately interpreted or dealt with experimentally, until it has been considered with reference to the place which the organisms to which it pertains hold in the system of classification. To illus-

trate, no generalization about the chromosomal structure and behavior in the spermatogenesis of species *x* of genus *a* can be accepted as fully valid until compared with the chromosomal structure and behavior of species *M*, *N*, *O*, *P*, etc., of the same genus. And a like restriction must be placed on generalization about the reaction of species *x* to light, or to any other stimulus, or to its distribution in nature, and so on.

To undertake the recital of special researches in support of this proposition would be to undertake the review of most of the recent investigations in the provinces of biology mentioned. And notice this: The results of these researches look in the direction indicated despite the fact that in most cases the studies had little or no systematic intention. The great amount of evidence of this purport is mostly incidental to other motives of investigation.

I would not be understood as advancing the hypothesis that every species of plants and animals differs from every other species to some extent in every attribute. What I affirm is that the inductive evidence has now gone so far toward proving every sharply differentiated species to contain some differentia in all the main provinces of their structure and function, that to assume the absence of such differentia in any given case, is unwarranted.

Although in the interests of practical biology it is desirable that a searching examination of the whole range of biological knowledge should be made from the taxonomist's standpoint, for a short theoretical discussion like that in which we are now engaged all that is incumbent upon us is to look, and that only cursorily, into a single province of biology, namely, biochemistry. This is all that is necessary, I say, because the analysis of all phenomena of life into chemistry and physics being the ultimate goal of biology according to the now dominant biological philosophy, if it turns out that the chemical analysis is exhaustive only when done on the basis of taxonomy, then it would seem to follow necessarily that all phenomena of structure and function intervening between the grosser morphological features with which taxonomy has for the most part busied itself, and the ultimate physico-chemical features, must also be brought to a taxonomic basis before they are exhaustive.

It would be difficult to find a better example of weightiness of inductive evidence as dependent upon cumulation in particular lines, and convergence of different lines, than that presented by biochemistry bearing on the hypothesis here under consideration. Concerning the evidence of the chemical differentiation of species drawn from investigations on the blood of higher animals, recall the results of Reichart and Brown on the crystallization of hemoglobin. Here is one of their statements:

Each form, *a*-oxyhemoglobin, *b*-oxyhemoglobin, etc., appears always in its own proper form and axial ratio when the blood of different individuals of the same species is examined. . . . But upon comparing the corresponding substances in different species of a genus, it is generally found that they differ one from the other to a greater or less degree; the differences being such that when complete crystallographic data are at hand the species can be distinguished by these differences in their hemoglobins.

Let us assume there is ground for questioning the full trustworthiness of this conclusion. Notice the strong presumption of its general reliability produced by its accordance with evidence from a wholly different kind of research on the serum of blood, namely, that on the precipitin reaction; and from still another kind, namely, that on the hemolytic action of one blood upon another. Nor should we fail to recognize the convergence of evidence for chemical specificity of organisms drawn from comparative investigation on milk; on the enzymes of digestion; and from such direct analyses of organic structure as those of the sperm of many species and genera of fishes. I mention only one other line of evidence of like purport clearly to be counted as chemical, though not usually so cited; namely, that of the odors and flavors of plants and animals. This is an exceedingly rich field of inquiry, even though difficult of cultivation by ordinary laboratory methods. The methods to be chiefly relied upon here are those of the senses of smell and taste, and it is interesting to reflect that there is available for utilization not merely these senses in man, but in animals as well. In the olfactory sense of the ant and the scent hunting dog, for example, we have a method of chemical discrimination—of qualitative chemical analysis if you please—which seems to surpass in delicacy anything laboratory manipulation can hope to attain.

Natural history and biochemistry are being inevitably drawn together by the very nature of their subject matter. Descriptive zoology and botany are becoming chemical in part, and bio-chemistry is becoming zoological and botanical in part. Organisms are indeed being "reduced to chemistry" in the familiar phrase; but the statement tells only half the story, unless it specifies the *particular* chemistry to which they are reduced. Each kind of organism has a chemistry to some extent unique. In one of its aspects biochemistry is becoming a subdivision, or branch, of systematic zoology and botany, just as anatomy has been for a long time. "Almost any group of tissues," said Minot, "would offer a favorable opportunity for the discussion of genetic classification." Seemingly the same may be said of biochemical substances.

Many biologists working in several provinces of the organic realm, particularly in those which, like cytology and biochemistry are concerned with the minute and difficultly observed structure and functions of organisms, appear to be laboring under the delusion that they are doing something totally different from description. They seem to think their work

apart from and exalted above description if they can apply the terms analysis, or especially causal analysis, to it. As though the treatment of causal factors which are intrinsic in an organism were not part of the description of that organism, and as though causal factors extrinsic to the organism; that is, belonging to the organism's environment, were essentially a part of biology at all! I believe full and unbiased consideration will convince any one that the word analysis, occurring so frequently in recent biological writings, always means *analytic description and classification*, as these terms are elucidated above, if it has any objective meaning at all. It is undoubtedly true that as touching organisms themselves a vast amount of analysis has been practised upon them that is not descriptive; but this is because it is purely speculative—because it is subjective and not objective. Most of the analysis of the characters of adult organisms into “determinants,” “determiners,” “factors,” etc., of the germ, is of this sort. And as touching the environments of organisms it is a remarkable thing once one comes to notice it duly that the results of innumerable researches have been published in biological journals during the last two or three decades, that were not in a strict sense biological. The studies were undertaken not so much to learn the nature of organisms as to test the properties of certain physical and chemical agents in respect to their influence on organisms. Incidentally, one might almost say, they have brought out many suggestive facts about how organisms may behave when placed under unusual and unnatural conditions. But they have not taught us so very much about the normal behavior of normal organisms under normal conditions. Indeed, a considerable number of biologists have been so bewildered by what they have seen and by their mode of speculating, that they have seriously questioned whether there is such a thing as a normal organism in a normal environment!

The sooner it is borne in upon the minds of all students of living beings, no matter with what aspects of such beings they may be occupied, that they are engaged in the great task of describing and classifying the living world; and, so far as “pure biology” is concerned, are doing nothing else, the sooner will objective biology get itself set off from subjective biology and the sooner will philosophical biology become purged of the many morbid growths which now impair its health and mar its beauty. Never more than in this present day when experimental research has gained so wide and lasting, and, on the whole, beneficent a hold in biology, has there been need of fidelity to description and classification. Never more than now, I say, because the practical work of experimentation on organisms does not promote observance of the classifier's watchword neglect nothing. Indeed, when the experimental method is raised, as some enthusiasts try to raise it, to the high place of an end in itself, the tendency is rather to neglect everything except

the one or a very few things which the experimenter must of necessity make the object of each special piece of work.

Although the practical biologist knows that his strivings after explanation are utterly futile unless always accompanied by description the spell of subjectivistic metaphysics is still so strong over science that not many biologists have yet grasped the fact that all true explanation is reached through description. Investigators rarely seem to notice that the explanations they propose are usually in reality hypotheses, and that the proof, or the greater or less probability of truth of these explanations (hypotheses) are wholly dependent upon the accuracy and fullness of description to which the organisms are subjected in the aspects of them to which the explanations pertain. Take the classic case of Goethe's explanation of the flower as a transformed branch with its leaves. Is it not true that just in so far as this explanation is accepted it is done on the basis of the accepted descriptions of flowers and branches and leaves? If a true explanation of cancer is ever reached does any one fail to recognize, when he thinks about the matter, that it must come in the form of well-verified description and classification of the whole complex of organic phenomena implicated in the disease?

A true though incomplete distinction between description in the ordinary sense and explanation in the ordinary sense is that the process of describing is very little guided by hypothesis, while explaining is very largely so guided.

Early in the paper, I promised to say something about the baneful effects that have flowed from the neglect by modern biology of the principles of description and classification. *Sine systeme chaos*, is the motto standing at the head of an elaborate, recently published work on the arrangement of the animal kingdom. This motto should be adopted, in substance at least, for any and every comprehensive biological treatise, no matter in what field; and I insist that failure to adopt it has thrown the speculative biology of our time into a literal state of chaos.

The revolt against the dry and formal nomenclatorialism into which biology had wandered in the period immediately preceding Darwin, has gone so far as practically to deny that many of the really best established, most important names in biology have any essential meaning at all. Witness, for example, the effort now taking shape with a few biologists, notably with J. S. Haldane, "to raise the term organism to the level of a category," as Henderson has characterized Haldane's undertaking. As a matter of fact, the effort is to restore, not to originally elevate the term, for a study of the history of biological theory clearly discloses that the term organism was long ago accepted as a category in the very best writings. For example, whenever the cell is interpreted as an "elementary *organism*," as it has usually been since Brücke first

conceived it thus, organism is acknowledged to be a "category"—a real entity—of biology.

From the extreme devotion to description and classification which characterized the older biology, the new has gone, in several of its most important aspects, to the opposite extreme of scarcely any accurate description and classification at all. Very few biologists appear to have considered how this attitude toward systematization has affected philosophical biology, and especially the biology of man, and so the general theories of human life, and influence upon human conduct.

We approach here a matter of vast scope, one altogether too vast to be more than touched in a communication like this. But there is one segment of it which, though lying close to the field of biology proper and of great importance, appears to have attracted the attention of professional biologists but little.

I refer to that melange (the thing will not allow itself to be called a system) of utterances and more or less definite teachings about the human species that has got into men's minds during the last thirty or forty years, and has found its fullest expression in the writings of Friedrich Nietzsche.

Surely biologists have not taken as much note as they should of the insistence by philosophical anarchists and other disciples of Nietzsche that their prophet is the particular and supreme "philosopher of evolution."

Into the tumultuous whirlpool of discussion of the Nietzschean doctrines I have no wish to enter, at least in this place; but a few things about it I believe ought to receive consideration by biologists, especially by American biologists. Should the matter be thus attended to, I believe it will be seen that there is a great measure of truth in the claim for Nietzsche as the philosopher of evolution; evolution being conceived as it usually has been in the modern period; and the particular point I want to make is that he did his philosophizing, primarily about man and very secondarily about the rest of the living world, in all but total disregard of, seemingly in almost total ignorance of, the natural history aspect of biology. His appeals to physiology, or something he called physiology; and to some of the results and conceptions of physiological psychology (although I do not recall his having used exactly this phrase) were constant and often very telling. But his neglect of, yes, more than that, his positive antipathy for the systematic, the coordinational, the interdependent aspects of living nature are striking indeed, once one comes to study his works with the point definitely in mind. I have searched, vainly, both in his own writings and in those of several professed followers of his, for evidence that the conceptions organism and "organic" with the meaning these terms have to every genuine natural history biologist, enter in any definite and positive fashion into his

philosophy. And here is the point that ought to arrest the attention of scientific men, indeed of all thoughtful persons. So far as concerns this vital matter the Nietzschean school is in strict accord with the "habits of philosophizing," as Whewell calls it, now dominant in biology.

Listen to this, one of Nietzsche's "Apophthegms and Darts" occurring in the "Twilight of the Idols":

I mistrust all systematisers and avoid them. The will to system is a lack of rectitude.

What a familiar sound this has to those who, from being at home in the discussions of recent speculative biology, have had dinned in their ears the doctrine that systematic zoology and botany are old-fashioned, childish and insignificant! Of course any one even moderately acquainted with Nietzsche's writings knows that what he was aiming at primarily in inveighing against systems was the systems of traditional philosophy. And undoubtedly, as Mügge remarks: "many have been drawn to him for this very reason." Presumably most persons, be they scientists or philosophers, or be they admirers or detestors of Nietzsche, would easily and willingly recognize that he knew little and cared less about the systems of natural history. They would go further and say that that fact had no essential relation to his antipathies against systems of philosophy. And this brings us back to the main point—the point to which, according to my view, men neither of science nor of philosophy have given sufficient attention, namely, that the system, the orderliness which every educated person now knows to be so greatly characteristic of living nature, must enter fundamentally into any philosophy of man and the animate world generally in order that that philosophy may be even approximately true and in any way adequate.

The following quotation from "Beyond Good and Evil" will open the way to a perception of the kindred between Nietzscheism and modern theoretical biology. He says:

Let me be pardoned as an old philologist who can not desist from the mischief of putting his finger on bad modes of interpretation, but "Nature's conformity to law," of which you physicists talk so proudly as though—why it exists only owing to your interpretation and bad "philology." It is no matter of fact, no "text" but rather just a naïvely humanitarian adjustment and perversion of meaning, with which you make abundant concessions to the democratic instincts of the modern soul.

The items in this which specially concern us are the references to nature and democracy. Nietzsche appears to have felt as genuinely and deeply as any modern whatever the importance of "return to nature"—a cry which, though hackneyed, he was willing to adopt. For this feeling he is entitled, as an esthetic philosopher, to great credit. The keenness of perception and vigor of expression with which he protests against the repudiation of external nature, the vilification of the human body,

and the distrust of the senses as these abominations have manifested themselves in the great systems of historical philosophy from the later Greek period, on through the heyday of Christian theology, down into the modern era of German subjectivism, deserve the careful and sympathetic regard of every man of science. The best of his utterances under this head which I have found are contained in "Beyond Good and Evil," and "The Twilight of the Idols." The chapter on "Prejudices of Philosophers" in the first mentioned, and the sections, "The Problem of Socrates," "Reason in Philosophy," and "Morality as Anti-naturalness" deserve special mention.

The disastrous mistake made by Nietzsche and into which his disciples have followed him, was in believing that he *actually did* "return to nature." As a matter of fact he never came any nearer nature than did J. J. Rousseau, who raised such a hullabaloo a century and a half ago over the same subject, and for whom Nietzsche professed such an ardent hatred. It is easy for a student of real nature to understand why Nietzsche hated Rousseau more spleenishly, if such a thing were possible, then he hated people generally. Probably it was because he vaguely realized that he was doing just what Rousseau tried to do, *i. e.*, *make of* nature what he would like to have it; and then saw that what Rousseau wanted nature to be was almost the antithesis of what he himself wanted it to be. While Rousseau wanted nature to be peaceful, gentle, benevolent and all that, and so easily found enough in it to make himself believe it to be essentially of this sort, Nietzsche as easily found enough in it to convince him that in its fundamentals nature is of the sort he liked; that is, selfish and powerful and hard and cruel.

Biologists ought to examine right carefully Nietzsche's famous doctrine of "Will to Power." His effort to make this a universal and all-sufficing principle of living nature had its strict counterpart, if not, indeed, its inspiration and model, in struggle survivalism of the Weismannian type. And the doctrine has degenerated into a sort of fiendish crotchet with many of Nietzsche's disciples, much as strugglism has with many biologists. And the reasoning, if reasoning it can justly be called, is much the same by the two sets of persons. "Wherever I found living matter," said Nietzsche, "I found will to power, and even in the servant I found the yearning to be master." (Thus spake Zarathustra.) As an illustration take an alligator, a great hunk of "living matter," sunning itself on a sand bank for hours at a time without so much as flopping its tail. What a striking case of willing to power! And what determination of a servant to be a master! Or if Nietzsche by chance ever looked through a microscope at the slow come-and-go of protoplasm confined within the cell membrane in a hair of a spider-lily, what a convincing proof of "will to power" and "desire for mastery" he had before him!

And one finds illustrations and arguments quite as convincing almost

every time he consults any orthodox Selectionist. For instance, such a biologist will watch with you a hornbill, a bird the size of a hen with a bill as large as the horn of a two-year-old bull, as the creature strives to get its bill out of its way so it can see its food, and then displays its ingenuity in getting the food far enough back in its immobile, bony mouth to enable it to swallow the morsel, and will explain to you without a smile how this bird and its ancestors have been able to survive in the struggle for existence because of the masterful bill! Or, coming down to pure and overwhelming logic, such a biologist will affirm (still without a smile) that you are bound to accept his explanation of the hornbill's bill unless you have some better explanation to offer! And he will go yet further (still in dead earnest) and tell you *he* and not you, must be the judge of which explanation is better. A very rudimentary sense of humor is another and by no means an unimportant trait-in-common between Nietzscheans and the dominant school of speculative biologists.

But that in particular which ought to make these biologists join with the disciples of Nietzsche in proclaiming their prophet the supreme philosopher of evolution is intimated in the above quotation,

Nature's conformity to law is no matter of fact . . . but rather just a naïvely humanitarian adjustment and perversion of meaning with which you make abundant concessions to the democratic instincts of the modern soul.

The tap-root of the life philosophy of both groups is the dogma that the gross, easily seen living things about us everywhere and all the time are "mere outward expressions" of an Essence, deep, invisible, intangible, a comprehension of the working of which and the control of which is the goal of all life science.

To be sure, the fact that temperamentally Nietzsche was highly artistic and very little scientific made him interpret and evaluate human life in terms very different from those used by the biologists when they treat of man. But the close kindred between "Nietzsche's cloud-like visions of Eternal Recurrence and Superman" and the nebulous hereditary substance, germ plasm, and "The Fit" of most biological eugenists should not be overlooked by anybody interested in problems of human welfare. Nietzsche's followers have not been slow to see the meaning of the man-breeding proposals of our day. Mügge says:

In Galton's Eugenics, founded upon the idea of evolution and the assumption that the human will is in some small measure capable of guiding the course of evolution, we see a scientific realization of Nietzsche's dreams.

And let no one, especially in this democratic country of ours, neglect to mark well the character of those dreams: Aristocracy carried through to its logical end. The best shall rule and "by means of force." The best shall be masters; the commonalty their slaves, literally and not figuratively. The only law shall be the law of the strong, the fit.

Those eugenists whose biological philosophy rests on germ-plasmic

fatalism, appear not to have recognized—probably because the goal is so far away—that they face toward an aristocracy most hateful to one who knows what democracy really means. Here again Nietzsche was more far-sighted than his biological counterparts, for he clearly saw and loudly proclaimed that supermen must be a very few very select masters with the great common “herd” their slaves.

And so our discussion turns back to its beginning. The laws of interdependence, of reciprocal connection and action which seem to pervade all living nature and bind it into a great, infinitely complex unity are only a seeming, only an outward manifestation of the ultimate Reality, so the dominating biologists accord with Nietzscheans in declaring. The “web of life” of which the ordinary man recognizes himself to be a part and which vulgar natural history strives to accurately describe and define and to naturally classify, is of little profit or interest because unreal or at best semi-real, say *οἱ ἀριστοὶ* the aristocracy of modern biology.

We may hope a generation of students of nature will arise after a while, a majority of whom will genuinely believe and act in accordance with their faith, that common sense has a real part in the interpretation of nature. And when such biologists come and succeed in making themselves heard and felt there may be ushered in an era of rule of the best who will be indeed best because they will rule according to the law of the whole and not by the law of some Being above or beneath or somewhere else outside of nature, whether called superman or the fit, or by some other name.

It is high time that natural history should “exert its due influence upon the current habits of philosophizing.”